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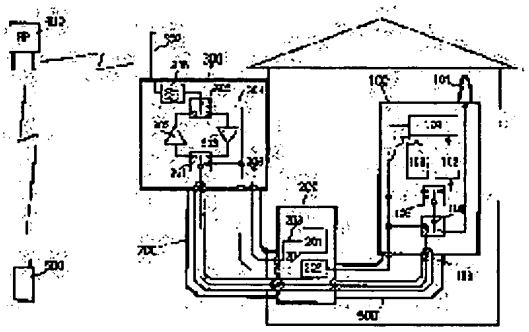
(54) RADIO FIXED TERMINAL EQUIPMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce radio circuit cost by utilizing the radio function of a portable terminal, also to prevent the deterioration of radio communication performance due to transmission loss of a cable for outdoor antenna and to secure high radio communication performance.
SOLUTION: An exterior antenna terminal 108 of a portable terminal 100 is connected to an exterior fixed terminal 300 through a cable 600, an indoor fixed terminal 200 and a cable 700. The terminal 300 amplifies a transmission signal from the terminal 100 and sends it from an exterior antenna 307 at the time of sending, and performs low noise amplification of a receiving signal from the antenna 307 and inputs it to the terminal 100 at the time of receiving. By utilizing a radio function of the portable terminal, it is possible to ignore a radio circuit of a radio fixed terminal and to reduce cost. Also, it is possible to secure high radio communication performance even when the portable terminal is used because the exterior fixed terminal compensates transmission loss of a cable.



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CLAIMS

[Claim(s)]
[Claim 1] It is wireless built-in end equipment possessing an outdoor antenna, outdoor built-in end equipment, inside-of-a-house built-in end equipment, and personal digital assistant equipment. Said outdoor built-in end equipment A 1st RF change means to choose said outdoor antenna as the output of said transmitting amplifier, or an input of said head amplifier, and to connect with transmitting amplifier, a head amplifier, and an external terminal, It has a 2nd RF change means to choose said external terminal as the input of said transmitting amplifier, or the output of said head amplifier, and to connect. Said inside-of-a-house built-in end equipment It is wireless built-in end equipment which is connected to the service cable from the external terminal of said outdoor built-in end equipment to indoor, and is characterized by said personal digital assistant equipment having the change means which changes the external antenna terminal which connects said inside-of-a-house built-in end equipment, and an internal antenna.
[Claim 2] Wireless built-in end equipment according to claim 1 characterized by having formed two or more said outdoor antennas, having formed a 3rd RF change means to choose said two or more outdoor antennas in said outdoor built-in end equipment, and preparing the control section which chooses an antenna with the highest received field strength among said two or more outdoor antennas using the received field strength information outputted from said personal digital assistant equipment in said inside-of-a-house built-in end equipment.
[Claim 3] It is wireless built-in end equipment by the frequency division duplex system (FDD) possessing an outdoor antenna, outdoor built-in end equipment, inside-of-a-house built-in end equipment, and personal digital assistant equipment. Said outdoor built-in end equipment The antenna common machine connected to said outdoor antenna, and the transmitting amplifier connected to said antenna common machine, It has the head amplifier connected to said antenna common machine, the transmitting input terminal connected to said transmitting amplifier, and the receiving output terminal connected to said head amplifier. Said inside-of-a-house built-in end equipment It connects with the service cable from the transmitting input terminal and receiving output terminal of said outdoor built-in end equipment to indoor. Said personal digital assistant equipment Wireless built-in end equipment characterized by having the change means of the external transmitting output terminal linked to said inside-of-a-house built-in end equipment, the external receiving input terminal linked to said inside-of-a-house built-in end equipment, said external transmitting output terminal and said external receiving input terminal, and an internal antenna.
[Claim 4] The 1st outdoor antenna and the 2nd outdoor antenna which were connected to the antenna common machine as said outdoor antenna are formed. The 1st head amplifier connected to said antenna common machine as said head amplifier and the 2nd head amplifier connected to said 2nd outdoor antenna are formed. A RF change means to choose the output of said 1st head amplifier and the 2nd head amplifier is formed in said outdoor built-in end equipment. So that an antenna with high received field strength may be chosen among said 1st outdoor antenna and the 2nd outdoor antenna using the received field strength information outputted from said personal digital assistant equipment Wireless built-in end equipment according to claim 3

characterized by preparing the control section which controls said RF change means in said inside-of-a-house built-in end equipment.
[Claim 5] The external antenna terminal of inside-of-a-house built-in end equipment and personal digital assistant equipment is connected at any time indoors. At the time of transmission The sending signal from the transmitting section of said personal digital assistant equipment is sent to outdoor built-in end equipment through a cable from said inside-of-a-house built-in end equipment, and it amplifies with transmitting amplifier, and transmits from an outdoor antenna. At the time of reception The correspondence procedure of the wireless built-in end equipment characterized by amplifying the input signal from said outdoor antenna with the head amplifier of said outdoor built-in end equipment, and inputting into the receive section of said personal digital assistant equipment through said cable and said inside-of-a-house built-in end equipment.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the wireless built-in end equipment using personal digital assistant equipment about the wireless built-in end equipment of a wireless local loop system.
[0002]
[Description of the Prior Art] As shown in for example, the Patent Publication Heisei No. 506471 [eight to] official report, and a JP,8-504071,A official report, a wireless local loop (WLL) The wireless built-in end equipment (referred to as WAFU) installed indoors, and movable personal digital assistant equipment (referred to as SU or PS), It is known as a system which generally connects between two or more base transceiver stations (referred to as RP or BS) which separated a fixed distance, and have been arranged in a service area, and were connected to the network of a cable system by digital radiocommunication of a 2GHz band.
[0003] Conventionally, as shown in drawing 5 , the wireless built-in end equipment in the above-mentioned WLL system has arranged the wireless circuit inside the built-in end equipment installed indoors, and it was constituted so that even the outdoor antenna installed in the outdoors with the coaxial cable etc. might transmit a high frequency signal (2GHz band). Hereafter, the conventional example is explained using drawing 5 .
[0004] In 800, in drawing 5 , conventional built-in end equipment and 900 show home telephone. The home telephone 900 is connected to built-in end equipment 800 by the modular cable 807, and the high frequency signal from built-in end equipment 800 is connected to an outdoor antenna 806 by the coaxial cable 805. The telephone number from the home telephone 900 is modulated by the control section 804, and it is changed into a digital radio signal through a sending circuit 803 and the transmission-and-reception electronic switch 801, goes up to a base transceiver station 400 by built-in end equipment 800 through an outdoor antenna 806, and is

sent out as a radio signal with it. Moreover, it gets down from a base transceiver station 400, and it is inputted into a receiving circuit 802 through an outdoor antenna 806, a coaxial cable 805, and the transmission-and-reception electronic switch 801, it gets over by the control section 804, and a radio signal is outputted to the home telephone 900 as a telephone signal.
[0005]
[Problem(s) to be Solved by the Invention] In the conventional example of drawing 5 , the loss (generally 5 thru/or about 10dB) by the coaxial cable 805 will cause the wireless performance degradation of the whole system. Moreover, when a receiving circuit 802, a sending circuit 803, and a control section 804 are needed for built-in end equipment 800 and the subscriber owns personal digital assistant equipment, these wireless circuits are needed for a duplex.
[0006] As mentioned above, it sets to the wireless built-in end equipment by the conventional example. [when the terminal subscriber holds the both sides of personal digital assistant equipment and wireless built-in end equipment and does not use simultaneously wireless built-in end equipment and personal digital assistant equipment on a system] Two or more wireless circuit costs which are not used simultaneously will contain in a duplex at device cost, and caused the cost rise of the whole system, and the technical problem that a subscriber's cost burden was increased occurred. Moreover, in the wireless built-in end equipment by the above conventional examples, since a thing [comparatively low price / as a coaxial cable (about / Generally 5 thru/or 10 / m) which connects an outdoor antenna with the built-in end equipment installed indoors] had to be used, degradation of the radiocommunication engine performance by the transmission loss (5 thru/or about 10dB) had become a problem.
[0007] Moreover, in the wireless built-in end equipment by the above conventional examples, since it corresponded to high-speed-data transmission at the time of a built-in end communication link, it needed to consider as the wireless circuit which can be transmitted and received simultaneously with the frequency division duplex system (FDD), and the technical problem that wireless circuit cost increased occurred.
[0008] In this invention, the above problems are solved, and it prevents wireless circuit cost containing in a duplex at device cost, and degradation of the radiocommunication engine performance by the transmission loss of a coaxial cable is prevented, and it aims at offering the wireless built-in end equipment which secured the high radiocommunication engine performance. Moreover, the wireless circuit which can be transmitted and received to the coincidence for corresponding to high-speed-data transmission aims at offering cheap wireless built-in end equipment with an easy configuration.
[0009]
[Means for Solving the Problem] In order to solve the above-mentioned problem, in this invention, outdoor built-in end equipment and an outdoor antenna equipped with transmitting amplifier and a head amplifier are connected outdoors, outdoor built-in end equipment and inside-of-a-house built-in end equipment are connected with a cable, and the external antenna terminal of inside-of-a-house built-in end equipment and personal digital assistant equipment is considered as the configuration connected indoors. Moreover, outdoor built-in end equipment and an outdoor antenna equipped with an antenna common machine, transmitting amplifier, and a head amplifier are connected outdoors, outdoor built-in end equipment and inside-of-a-house built-in end equipment are connected with a cable, and the external antenna terminal of inside-of-a-house built-in end equipment and personal digital assistant equipment is considered as the configuration connected indoors.
[0010]
[Embodiment of the Invention] Invention of this invention according to claim 1 is wireless built-in end equipment possessing an outdoor antenna, outdoor built-in end equipment, inside-of-a-house built-in end equipment, and personal digital assistant equipment. Said outdoor built-in end equipment A 1st RF change means to choose said outdoor antenna as the output of said transmitting amplifier, or an input of said head amplifier, and to connect with transmitting amplifier, a head amplifier, and an external terminal, It has a 2nd RF change means to choose said external terminal as the input of said transmitting amplifier, or the output of said head amplifier, and to connect. Said inside-of-a-house built-in end equipment It connects with the

service cable from the external terminal of said outdoor built-in end equipment to indoor. Said personal digital assistant equipment While being wireless built-in end equipment which has the change means which changes the external antenna terminal which connects said inside-of-a-house built-in end equipment, and an internal antenna and communicating using the wireless circuit of personal digital assistant equipment It has an operation of compensating the transmission loss of a coaxial cable and securing the high radiocommunication engine performance.

[0011] Invention of this invention according to claim 2 is set to wireless built-in end equipment according to claim 1. Form two or more said outdoor antennas, and a 3rd RF change means to choose said two or more outdoor antennas is formed in said outdoor built-in end equipment. The control section which chooses an antenna with the highest received field strength among said two or more outdoor antennas using the received field strength information outputted from said personal digital assistant equipment is prepared in said inside-of-a-house built-in end equipment. In time-sharing duplex operation (TDD), it has an operation of performing transceiver diversity actuation.

[0012] Invention of this invention according to claim 3 is wireless built-in end equipment by the frequency division duplex system (FDD) possessing an outdoor antenna, outdoor built-in end equipment, inside-of-a-house built-in end equipment, and personal digital assistant equipment. The antenna common machine by which said outdoor built-in end equipment was connected to said outdoor antenna, The transmitting amplifier connected to said antenna common machine, and the head amplifier connected to said antenna common machine, It has the transmitting input terminal connected to said transmitting amplifier, and the receiving output terminal connected to said head amplifier. Said inside-of-a-house built-in end equipment It connects with the service cable from the transmitting input terminal and receiving output terminal of said outdoor built-in end equipment to indoor. Said personal digital assistant equipment The external transmitting output terminal linked to said inside-of-a-house built-in end equipment, and the external receiving input terminal linked to said inside-of-a-house built-in end equipment, It is wireless built-in end equipment which has the change means of said external transmitting output terminal and said external receiving input terminal, and an internal antenna, and the wireless circuit which can be transmitted and received is simultaneously constituted using the wireless circuit of personal digital assistant equipment, and it has an operation of performing high-speed-data transmission.

[0013] Invention of this invention according to claim 4 is set to wireless built-in end equipment according to claim 3. The 1st outdoor antenna and the 2nd outdoor antenna which were connected to the antenna common machine as said outdoor antenna are formed. The 1st head amplifier connected to said antenna common machine as said head amplifier and the 2nd head amplifier connected to said 2nd outdoor antenna are formed. A RF change means to choose the output of said 1st head amplifier and the 2nd head amplifier is formed in said outdoor built-in end equipment. The control section which controls said RF change means to choose an antenna with high received field strength among said 1st outdoor antenna and the 2nd outdoor antenna using the received field strength information outputted from said personal digital assistant equipment is prepared in said inside-of-a-house built-in end equipment. In frequency division duplex operation (FDD), it has an operation of performing receiving diversity actuation.

[0014] Invention of this invention according to claim 5 connects the external antenna terminal of inside-of-a-house built-in end equipment and personal digital assistant equipment at any time indoors. At the time of transmission The sending signal from the transmitting section of said personal digital assistant equipment is sent to outdoor built-in end equipment through a cable from said inside-of-a-house built-in end equipment, and it amplifies with transmitting amplifier, and transmits from an outdoor antenna. At the time of reception The input signal from said outdoor antenna is amplified with the head amplifier of said outdoor built-in end equipment. While being the correspondence procedure of the wireless built-in end equipment inputted into the receive section of said personal digital assistant equipment through said cable and said inside-of-a-house built-in end equipment and communicating using the wireless circuit of personal digital assistant equipment It has an operation of compensating the transmission loss of a coaxial

cable and securing the high radiocommunication engine performance.
[0015] Hereafter, the gestalt of operation of this invention is explained using drawing 4 from drawing 1 .
[0016] (The gestalt of the 1st operation) The gestalt of operation of the 1st of this invention is wireless built-in end equipment which connects inside-of-a-house built-in end equipment and personal digital assistant equipment, amplifies the sending signal from the transmitting section of personal digital assistant equipment with the transmitting amplifier of outdoor built-in end equipment at the time of transmission, transmits from an outdoor antenna, amplifies the input signal from an outdoor antenna with the head amplifier of outdoor built-in end equipment at the time of reception, and inputs into the receive section of personal digital assistant equipment.
[0017] Drawing 1 shows the fundamental configuration of the wireless built-in end equipment in the gestalt of operation of the 1st of this invention. In drawing 1 , in 100, outdoor built-in end equipment and 400 show a base transceiver station, and, as for indoor personal digital assistant equipment and 200, 500 shows outdoor personal digital assistant equipment, as for inside-of-a-house built-in end equipment and 300. Generally digital radiocommunication of a 2GHz band connects with wireless built-in end equipment (100,200,300) and the outdoor personal digital assistant equipment 500 which were installed in the outdoors and installed indoors, and a base transceiver station 400 operates as time-sharing duplex operation (TDD), generally, repeats a transmit receive for every divisor ms, and communicates (transmission and reception are not carried out simultaneously).
[0018] Although personal digital assistant equipment 100 is used as a personal digital assistant usually used outdoors, it bears the wireless section and the call function of a built-in end indoors with the gestalt of this operation. Personal digital assistant equipment 100 consists of the built-in antenna 101, a receiving circuit 102, a sending circuit 103, a control section 104, the transmission-and-reception change section 105, the internal external antenna change section 106, a transmission-and-reception change signal 107, and an external antenna terminal 108. With personal digital assistant equipment 100, the transmission-and-reception change section 105, a receiving circuit 102, and a sending circuit 103 are controlled by time sharing by the control section 104, and it operates so that a transmit receive may be repeated. If the detection function of the external antenna terminal 108 changes and the external antenna terminal 108 is connected, the internal external antenna change section 106 will turn off an internal antenna side, and it will operate so that it may connect with an external antenna side. The external antenna terminal 108 and the transceiver change signal 107 are connected to the inside-of-a-house terminal unit 200 by the house cable 600 (generally several m simply cable in which desorption is possible).
[0019] Inside-of-a-house built-in end equipment 200 consists of a power supply section 201 and a control section 202. In inside-of-a-house built-in end equipment 200, the signal from the external antenna terminal 108 of personal digital assistant equipment 100 is transmitted to the outdoor cable 700 as it is, and after the transmission-and-reception change signal 107 carries out buffer magnification by the control section 202, it is transmitted to the outdoor cable 700 as a transmission-and-reception change signal 204, and outputs the power source 203 for outdoor built-in end equipment 300 to the outdoor cable 700 from a power supply section 201.
[0020] Outdoor built-in end equipment 300 is installed in the outdoors, such as a wall of a house, and is constituted by transmission-and-reception electronic switch (1) 301, the transmitting amplifier 302, the receiving low noise amplifier 303, the transmission-and-reception change signal 304, transmission-and-reception electronic switch (2) 305, a band pass filter 306, and the outdoor antenna 307. A high frequency signal (it passes along a coaxial cable), the transmission-and-reception change signal 304, and a power source 308 are drawn indoors, and are connected to inside-of-a-house built-in end equipment 200 by the outdoor cable 700 (about [Generally 5 thru/or 10] m).
[0021] Actuation by the above configuration is explained below. The transmitting amplifier 302 of outdoor built-in end equipment 300 performs power amplification for compensating a lost part (5 thru/or about 10dB) of the sending signal in cables 600 and 700, and the input signal from an outdoor antenna 307 is inputted into the receiving low noise amplifier 303 by the minimum

(minimum distance) loss, and it operates so that low noise magnification may be carried out by the above-mentioned cable loss. As for the transceiver change actuation in outdoor built-in end equipment 300, transmission-and-reception electronic switch (1) 301 and (2) 305 are changed on the basis of the transmission-and-reception change signal 107 from personal digital assistant equipment 100. Therefore, the sending signal from a sending circuit 103 is sent out through a cable 600, inside-of-a-house built-in end equipment 200, a cable 700, and the transmitting amplifier 302 as a going-up radio signal from an outdoor antenna 307 to a base transceiver station 400. Moreover, it gets down from a base transceiver station 400, and a radio signal is inputted into a receiving circuit 102 through an outdoor antenna 307, the receiving low noise amplifier 303, a cable 700, inside-of-a-house built-in end equipment 200, and a cable 600.

[0022] By the above configurations, it can use as built-in end equipment indoors, and loss of the outdoors and a house cable can be compensated only with connecting the removable cable 600 to personal digital assistant equipment 100 simply, and the high wireless engine performance can be realized by it. Moreover, in personal digital assistant equipment 100, as an element added in order to realize the gestalt of this operation, although it is only the transmission-and-reception change signal 107 and the external antenna terminal 108, these elements are already prepared as a terminal for wireless performance measurements in common personal digital assistant equipment in many cases. Moreover, as an element required as built-in end equipment, it is a power supply section 201, a control section 202, transmission-and-reception electronic switch (1) 301, the transmitting amplifier 302, the receiving low noise amplifier 303, the transmission-and-reception change signal 304, transmission-and-reception electronic switch (2) 305, a band pass filter 306, and an outdoor antenna 307, and only a necessary minimum wireless circuit can realize the function of the gestalt of this operation.

[0023] Since the connection circuit with personal digital assistant equipment was established in wireless built-in end equipment as mentioned above according to the gestalt of operation of the 1st of this invention, personal digital assistant equipment can be indoors used as built-in end equipment, and loss of a cable is compensated, and the high wireless engine performance can be realized. Moreover, wireless built-in end equipment is realizable by the necessary minimum wireless circuit.

[0024] (Gestalt of the 2nd operation) The gestalt of operation of the 2nd of this invention is wireless built-in end equipment which performs transceiver diversity actuation in time-sharing duplex operation (TDD) by choosing an antenna with the highest received field strength among two or more outdoor antennas using the received field strength information outputted from the personal digital assistant equipment connected to inside-of-a-house built-in end equipment.

[0025] The point that the wireless built-in end equipment of the gestalt of operation of the 2nd of this invention differs from the gestalt of the 1st operation is having added the transceiver diversity function.

[0026] Drawing 2 shows the fundamental configuration of the wireless built-in end equipment in the gestalt of operation of the 2nd of this invention, and it constitutes it so that a transceiver diversity function may be added to the wireless built-in end equipment in drawing 1 . drawing 2 -- setting -- the function that the thing of the same sign as drawing 1 is the same -- having -- 109 and 206 -- a diversity change signal and 310 show an antenna electronic switch, and, as for a burst timing signal and 205, in a received field strength signal (RSSI), and 110 and 207, 314 and 315 show the 1st and 2nd outdoor antennas, respectively, as for a control section, and 208 and 311. In drawing 2 , actuation of drawing 1 and same actuation are performed as actuation of those other than transceiver diversity.

[0027] Hereafter, actuation of transceiver diversity is explained. In drawing 2 , a control section 205 detects the received field strength signal (RSSI) 109 by making into time base the burst timing signal 110 (signal of the transceiver timing which synchronized with the base station). A control section 205 controls the antenna electronic switch 310, and changes the 1st and 2nd outdoor antennas 314 and 315 again. Here, a control section 205 detects the received field strength signal (RSSI) 109 by each of the 1st and 2nd outdoor antennas 314 and 315 just before the receiving time basis (self-receiving slot) to which built-in end equipment is assigned, and controls it by the receiving time basis (self-receiving slot) to receive by the outdoor antenna 314

with the larger received field strength signal (RSSI) 109, or 315. Moreover, since the frequency of rise and fall (transmission and reception) is the same, transceiver diversity is realizable [the system in the gestalt of this operation is time-sharing duplex operation (TDD) and] with the transmitting time basis (self-transmitting slot) just behind a receiving time basis (self-receiving slot) by transmitting by the outdoor antenna 314 same immediately before or 315 [same immediately before] as a receiving time basis (self-receiving slot).
[0028] As mentioned above, the transceiver diversity function of wireless built-in end equipment can be realized in a necessary minimum wireless circuit, without having a transceiver diversity function in personal digital assistant equipment, since an outdoor antenna is chosen using the received field strength information outputted from personal digital assistant equipment according to the gestalt of operation of the 2nd of this invention.
[0029] (Gestalt of the 3rd operation) The gestalt of operation of the 3rd of this invention is wireless built-in end equipment by the frequency division duplex system (FDD) constituted so that connect inside-of-a-house built-in end equipment and personal digital assistant equipment at any time, and the sending signal from the transmitting section of personal digital assistant equipment is amplified with the transmitting amplifier of outdoor built-in end equipment, it might transmit from an outdoor antenna, the input signal from an outdoor antenna might be amplified with the head amplifier of outdoor built-in end equipment and it might input into the receive section of personal digital assistant equipment.
[0030] The point that the wireless built-in end equipment of the gestalt of operation of the 3rd of this invention differs from the gestalt of the 1st operation is having constituted so that it might correspond to high-speed-data transmission by frequency division duplex operation (FDD).

[0031] Drawing 3 shows the fundamental configuration of the wireless built-in end equipment in the gestalt of operation of the 3rd of this invention, and it constitutes it so that it may correspond to high-speed-data transmission according the wireless built-in end equipment in drawing 1 to frequency division duplex operation (FDD). drawing 3 -- setting -- the function that the thing of the same sign as drawing 1 is the same -- having -- 111 -- in the internal antenna external terminal change section and 112, an internal external change control signal and 312 show an outdoor antenna, and, as for an external receiving terminal and 113, 313 shows an antenna common machine, as for an external transmitting terminal and 114. If personal digital assistant equipment 100 is connected to inside-of-a-house built-in end equipment 200, the internal antenna external terminal change section 111 to which the internal antenna external terminal change section 111 is outputted from inside-of-a-house built-in end equipment 200 will be changed to the external receiving terminal 112 and external transmitting terminal 113 side by the internal external change control signal 114 currently outputted from inside-of-a-house built-in end equipment 200. Moreover, generally, the antenna common machine 313 consists of dielectric filters, and has the function which shares an outdoor antenna 312 simultaneously with both the transmitting amplifier 302 and the receiving low noise amplifier 303.
[0032] Generally, with a frequency division duplex system (FDD), it goes up (transmission), and gets down (reception), the frequency is close, and a dielectric filter large-sized [the antenna common machine 313] in order to secure the isolation in the frequency which approached, and expensive is used. Therefore, in personal digital assistant equipment 100, since it is difficult to build in the above-mentioned antenna common machine, it is made not to transmit and receive a receiving time basis (self-receiving slot) and a transmitting time basis (self-receiving slot), as a time amount target does not lap even if it is a frequency division duplex system (FDD) simultaneously. since a voice call is a key objective in personal digital assistant equipment -- that general in the transmission speed -- 32kbps extent -- it is -- the above-mentioned configuration -- the need -- it was enough.
[0033] However, in built-in end equipment, high-speed-data transmission (generally 64 or more kbpses) is required in many cases, and in this case, since it is necessary to use two or more receiving time bases (self-receiving slot) and transmitting time bases (self-transmitting slot), the configuration which can be transmitted and received is required simultaneously.
[0034] After the sending signal from the sending circuit 103 of personal digital assistant

equipment 100 is inputted into the transmitting amplifier 302 and amplified through a house cable 600, inside-of-a-house built-in end equipment 200, and the outdoor cable 700, it is transmitted from an outdoor antenna 312 through the antenna common machine 313. At this time, a sending signal does not leak to the receiving low noise amplifier 303 side with the antenna common vessel 313. Moreover, the input signal which received with the outdoor antenna 312 is inputted into the receiving circuit 102 of personal digital assistant equipment 100 through the antenna common machine 313, the receiving low noise amplifier 303, a house cable 700, inside-of-a-house built-in end equipment 200, and the outdoor cable 600.

[0035] As mentioned above, according to the gestalt of operation of the 3rd of this invention, high-speed-data transmission can be performed using the personal digital assistant equipment without an antenna common machine of a small low price by holding the function transmitted and received simultaneously in a built-in end side.

[0036] (Gestalt of the 4th operation) The gestalt of operation of the 4th of this invention is wireless built-in end equipment which chooses an antenna with high received field strength among the 1st and 2nd outdoor antennas, and performs receiving diversity actuation in frequency division duplex operation (FDD) using the received field strength information outputted from personal digital assistant equipment.

[0037] The point that the wireless built-in end equipment of the gestalt of operation of the 4th of this invention differs from the gestalt of the 3rd operation is having added the receiving diversity function.

[0038] Drawing 4 shows the fundamental configuration of the wireless built-in end equipment in the gestalt of operation of the 4th of this invention, and it constitutes it so that a receiving diversity function may be added to the wireless built-in end equipment in drawing 3 . In drawing 4 , the thing of the same sign as drawing 2 and drawing 3 has the same function, in 314 and 315, a band pass filter and 317 show the 2nd receiving low noise amplifier, and, as for the 1st and 2nd outdoor antennas and 316, 318 shows a receiving-antenna electronic switch, respectively. Through the band pass filter 316 from which it goes up (transmission) and the frequency component of a band is removed, the signal received with the 2nd outdoor antenna 315 is inputted 2nd receiving low noise amplifier 317, and low noise magnification is carried out. The output has either of the outputs of the 1st receiving low noise amplifier 303 chosen, and is inputted into the receiving circuit 102 of personal digital assistant equipment 100 by the receiving-antenna electronic switch 318 through a house cable 700, inside-of-a-house built-in end equipment 200, and the outdoor cable 600. Here, a control section 205 is controlled like drawing 2 to receive by the outdoor antenna 314 with the larger received field strength signal (RSSI) 109, or 315.

[0039] As mentioned above, according to the gestalt of operation of the 4th of this invention, using the received field strength information outputted from personal digital assistant equipment without a receiving diversity function, since an antenna with high received field strength is chosen, the receiving diversity function of wireless built-in end equipment is realizable in a necessary minimum wireless circuit.

[0040]

[Effect of the Invention] As mentioned above, since this invention uses personal digital assistant equipment as built-in end equipment indoors, it has the effectiveness that a part of wireless circuit of wireless built-in end equipment is excluded, and cost can be reduced.

[0041] Moreover, since cable loss is compensated with the amplifier of outdoor built-in end equipment, it has the effectiveness that the high wireless engine performance is realizable by the necessary minimum wireless circuit.

[0042] Moreover, since an outdoor antenna is chosen using the received field strength information outputted from personal digital assistant equipment, it has the effectiveness that the wireless built-in end equipment which performs transceiver diversity actuation with time-sharing duplex operation (TDD) in a necessary minimum wireless circuit using personal digital assistant equipment without a transceiver diversity function is realizable.

[0043] Moreover, since the function transmitted and received simultaneously was prepared in the built-in end side, it has the effectiveness that high-speed-data transmission can be performed

also with personal digital assistant equipment without an antenna common machine.
[0044] Moreover, since an outdoor antenna is chosen using the received field strength information outputted from personal digital assistant equipment, it has the effectiveness that the wireless built-in end equipment which performs receiving diversity actuation with frequency division duplex operation (FDD) is realizable.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The fundamental block diagram of the wireless built-in end equipment in the gestalt of the 1st operation,
[Drawing 2] The fundamental block diagram of the wireless built-in end equipment in the gestalt of the 2nd operation,
[Drawing 3] The fundamental block diagram of the wireless built-in end equipment in the gestalt of the 3rd operation,
[Drawing 4] The fundamental block diagram of the wireless built-in end equipment in the gestalt of the 4th operation,
[Drawing 5] It is the fundamental block diagram of the wireless built-in end equipment in the conventional example.
[Description of Notations]
100 Indoor Personal Digital Assistant Equipment
101 Built-in Antenna
102 802 Receiving circuit
103 803 Sending circuit
104, 202, 205, 804 Control section
105 Transmission-and-Reception Change Section
106 Internal External Antenna Change Section
107, 204, 304 Transmission-and-reception change signal
108 External Antenna Terminal
109 206 Received field strength signal (RSSI)
110 207 Burst timing signal
111 Internal Antenna External Terminal Change Section
112 External Receiving Terminal
113 External Transmitting Terminal
114 Internal External Change Control Signal
200 Inside-of-a-House Built-in End Equipment
201 Power Supply Section
203 308 Power source
208 311 Diversity change signal
300 Outdoor Built-in End Equipment

301 Transmission-and-Reception Electronic Switch (1)
302 Transmitting Amplifier
303 Receiving Low Noise Amplifier
305 Transmission-and-Reception Electronic Switch (2)
306 316 Band pass filter
307, 312, 806 Outdoor antenna
310 Antenna Electronic Switch
313 Antenna Common Machine
314 1st Outdoor Antenna
315 Time -- 2 Outdoor Antennas
317 2nd Receiving Low Noise Amplifier
318 Receiving-Antenna Electronic Switch
400 Base Transceiver Station
500 Outdoor Personal Digital Assistant Equipment
600 House Cable
700 Outdoor Cable
800 Built-in End Equipment
801 Transmission-and-Reception Electronic Switch
805 Coaxial Cable
807 Modular Cable
900 Home Telephone

[Translation done.]

* NOTICES *

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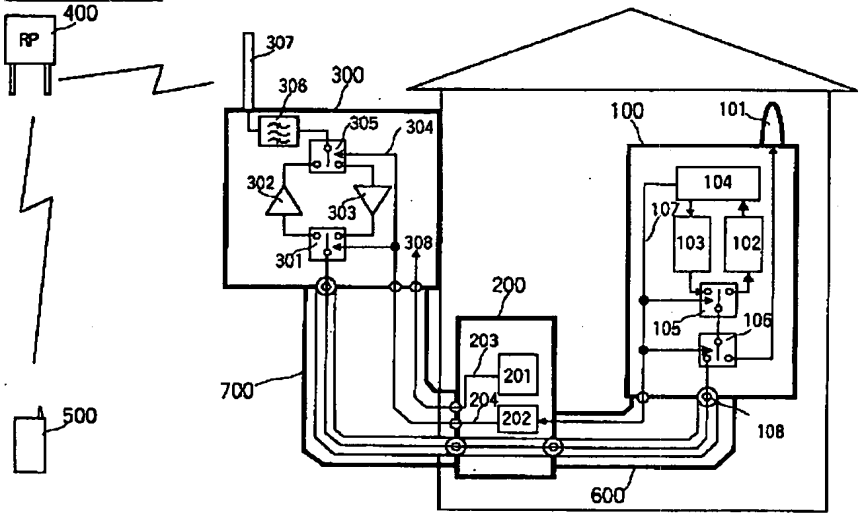
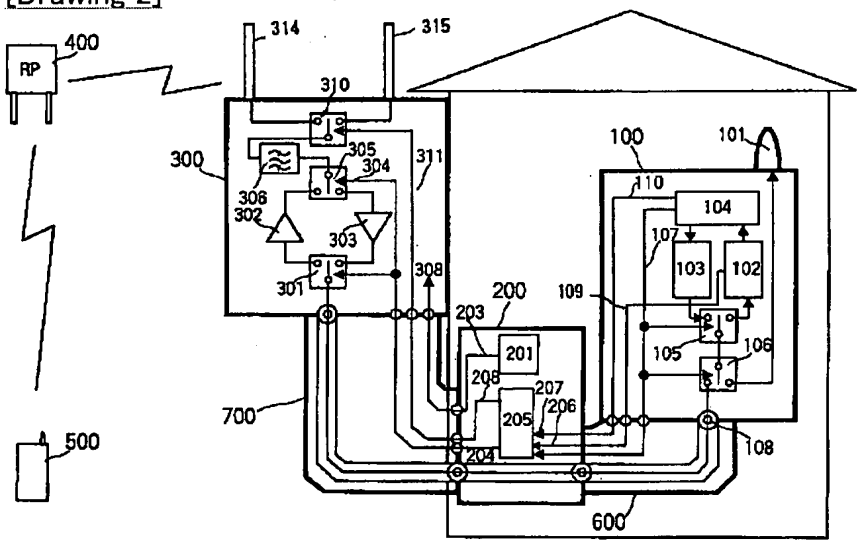
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

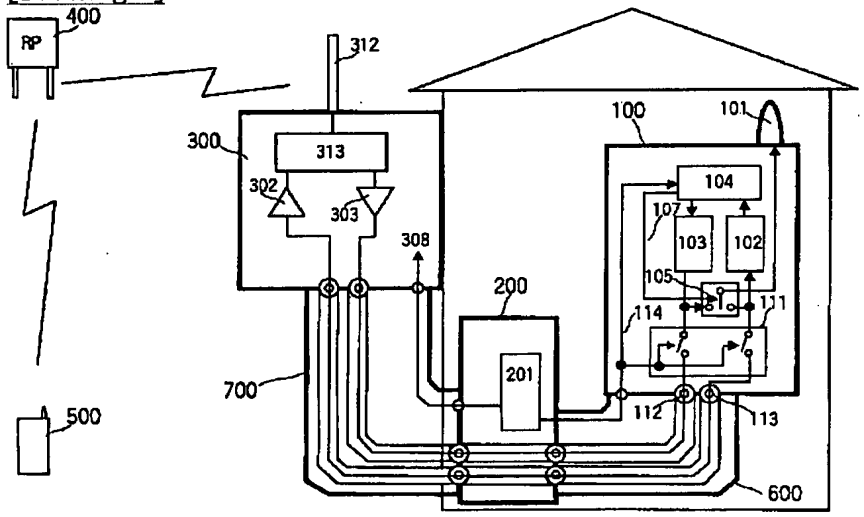
[Drawing 1]



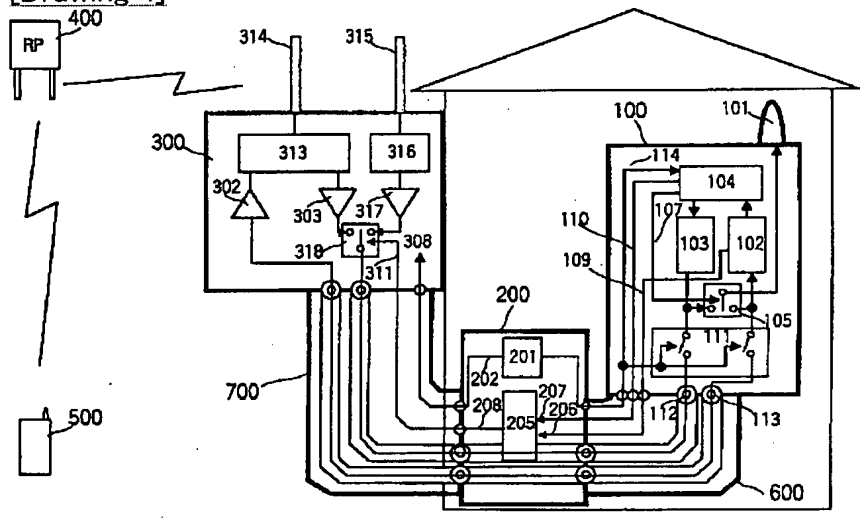
[Drawing 2]



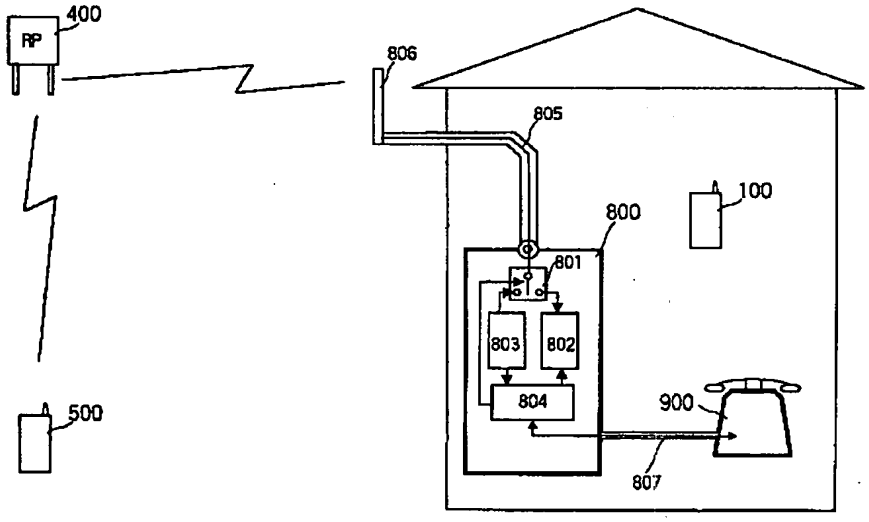
[Drawing 3]



[Drawing 4]



[Drawing 5]



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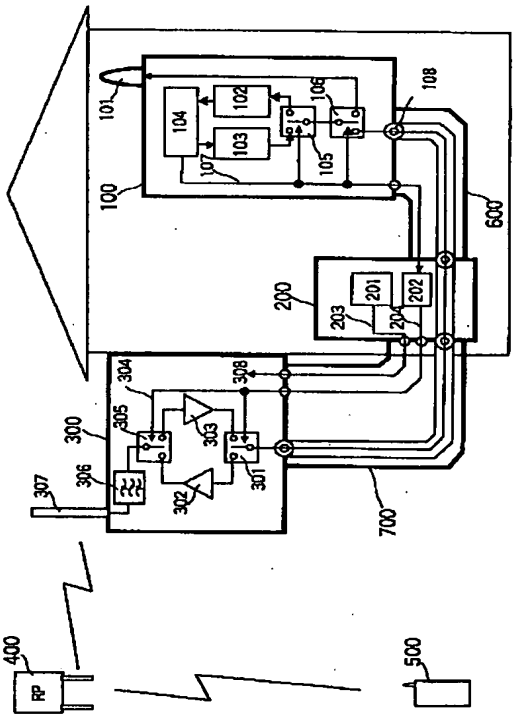
最終頁に続く

(54)【発明の名称】　無線固定端末装置

(57)【要約】

【課題】　無線固定端末装置において、携帯端末機の無線機能を利用して無線回路コストを削減するとともに、屋外アンテナ用ケーブルの伝送損失による無線通信性能の劣化を防いで高い無線通信性能を確保する。

【解決手段】　携帯端末機100の外部アンテナ端子108を、ケーブル600、屋内固定端末装置200及びケーブル700を介して、屋外固定端末装置300に接続する。屋外固定端末装置300では、送信時には携帯端末機100からの送信信号を増幅して屋外アンテナ307から送信し、受信時には屋外アンテナ307からの受信信号を低雑音増幅して携帯端末機100へ入力する。携帯端末機の無線機能を利用することにより、無線固定端末装置の無線回路を省いてコストを削減できる。また、屋外固定端末装置でケーブルの伝送損失を補償するので、携帯端末機を使っても高い無線通信性能を確保できる。



【特許請求の範囲】

【請求項１】　屋外アンテナと屋外固定端末装置と屋内固定端末装置と携帯端末装置とを具備する無線固定端末装置であって、前記屋外固定端末装置は、送信増幅器と、受信増幅器と、外部端子と、前記屋外アンテナを前記送信増幅器の出力か前記受信増幅器の入力かのいずれかに選択して接続する第１高周波切替手段と、前記外部端子を前記送信増幅器の入力か前記受信増幅器の出力かのいずれかに選択して接続する第２高周波切替手段とを有し、前記屋内固定端末装置は、前記屋外固定端末装置の外部端子から屋内への引き込みケーブルに接続されており、前記携帯端末装置は、前記屋内固定端末装置を接続する外部アンテナ端子と内部アンテナとを切り替える切替手段を有することを特徴とする無線固定端末装置。

【請求項２】　前記屋外アンテナを複数設け、複数の前記屋外アンテナを選択する第３高周波切替手段を前記屋外固定端末装置に設け、前記携帯端末装置から出力される受信電界強度情報によって複数の前記屋外アンテナのうち最も受信電界強度が高いアンテナを選択する制御部を前記屋内固定端末装置に設けたことを特徴とする請求項１記載の無線固定端末装置。

【請求項３】　屋外アンテナと屋外固定端末装置と屋内固定端末装置と携帯端末装置とを具備する周波数分割複信方式（ＦＤＤ）による無線固定端末装置であって、前記屋外固定端末装置は、前記屋外アンテナに接続されたアンテナ共用器と、前記アンテナ共用器に接続された送信増幅器と、前記アンテナ共用器に接続された受信増幅器と、前記送信増幅器に接続された送信入力端子と、前記受信増幅器に接続された受信出力端子とを有し、前記屋内固定端末装置は、前記屋外固定端末装置の送信入力端子及び受信出力端子から屋内への引き込みケーブルに接続され、前記携帯端末装置は、前記屋内固定端末装置に接続する外部送信出力端子と、前記屋内固定端末装置に接続する外部受信入力端子と、前記外部送信出力端子及び前記外部受信入力端子と内部アンテナとの切替手段とを有することを特徴とする無線固定端末装置。

【請求項４】　前記屋外アンテナとしてアンテナ共用器に接続された第１屋外アンテナと第２屋外アンテナとを設け、前記受信増幅器として前記アンテナ共用器に接続された第１受信増幅器と前記第２屋外アンテナに接続された第２受信増幅器とを設け、前記第１受信増幅器及び第２受信増幅器の出力を選択する高周波切替手段を前記屋外固定端末装置に設け、前記携帯端末装置から出力される受信電界強度情報によって前記第１屋外アンテナ及び第２屋外アンテナのうち受信電界強度が高いアンテナを選択するよう前記高周波切替手段を制御する制御部を前記屋内固定端末装置に設けたことを特徴とする請求項３記載の無線固定端末装置。

【請求項５】　屋内固定端末装置と携帯端末装置の外部アンテナ端子とを屋内にて随時接続し、送信時には、前記携帯端末装置の送信部からの送信信号を前記屋内固定端末装置からケーブルを介して屋外固定端末装置に送って送信増幅器で増幅して屋外アンテナから送信し、受信時には、前記屋外アンテナからの受信信号を前記屋外固定端末装置の受信増幅器で増幅して、前記ケーブルと前記屋内固定端末装置を介して前記携帯端末装置の受信部に入力することを特徴とする無線固定端末装置の通信方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、ワイヤレスローカルループシステムの無線固定端末装置に関し、特に、携帯端末装置を利用する無線固定端末装置に関する。

【０００２】

【従来の技術】ワイヤレスローカルループ（ＷＬＬ）は、例えば、特表平8-506471号公報及び特開平8-504071公報に示されるように、屋内に設置された無線固定端末装置（ＷＡＦＵと呼ばれる）や、移動可能な携帯端末装置（ＳＵ又はＰＳと呼ばれる）と、一定の距離を隔ててサービスエリア内に配置され、かつ有線系のネットワークに接続された複数の無線基地局（ＲＰ又はＢＳと呼ばれる）との間を、一般には２ＧＨｚ帯のディジタル無線通信で接続するシステムとして知られている。

【０００３】従来、上記のＷＬＬシステムにおける無線固定端末装置は、図５に示すように、屋内に設置された固定端末装置の内部に無線回路を配置し、高周波信号（２ＧＨｚ帯）を同軸ケーブルなどにより屋外に設置された屋外アンテナまで伝送するように構成されていた。以下、図５を用いて従来例の説明を行なう。

【０００４】図５において、800は従来の固定端末装置、900は家庭用電話機を示す。家庭用電話機900は、固定端末装置800にモジュラーケーブル807により接続され、固定端末装置800からの高周波信号は、同軸ケーブル805により屋外アンテナ806に接続される。固定端末装置800では、家庭用電話機900からの電話番号を制御部804にて変調し、送信回路803及び送受切替回路801を介してディジタル無線信号に変換され、屋外アンテナ806を介して無線基地局400に上り無線信号として送出される。また、無線基地局400からの下り無線信号は、屋外アンテナ806、同軸ケーブル805及び送受切替回路801を介して受信回路802に入力され、制御部804により復調されて家庭用電話機900に電話信号として出力される。

【０００５】

【発明が解決しようとする課題】図５の従来例においては、同軸ケーブル805による損失（一般には５ないし10ｄＢ程度）がシステム全体の無線性能劣化を招くことになる。また、固定端末装置800には、受信回路802、送信回路803及び制御部804が必要となり、加入者が携帯端末装置を所有している場合は、これらの無線回路が二重に必要になる。

【０００６】上記のように、従来例による無線固定端末装置においては、端末加入者が携帯端末装置と無線固定端末装置の双方を保有しており、システム上、無線固定端末装置と携帯端末装置を同時に使用することがない場合において、同時に使用しない複数の無線回路コストが二重に機器コストに含有されることになり、システム全体のコストアップを招き、加入者のコスト負担を増大するという課題があった。また、上記のような従来例による無線固定端末装置においては、屋内に設置された固定端末装置と屋外アンテナを接続する同軸ケーブル（一般には５ないし10m程度）として比較的低価格なものを使用せざるを得ないため、その伝送損失（５ないし10ｄＢ程度）による無線通信性能の劣化が問題となっていた。

【０００７】また、上記のような従来例による無線固定端末装置においては、固定端末通信時の高速データ伝送に対応するために、周波数分割複信方式（ＦＤＤ）により同時に送受信可能な無線回路とする必要があり、無線回路コストが増大するという課題があった。

【０００８】本発明では、上記のような問題を解決し、無線回路コストが二重に機器コストに含有されることを防ぎ、かつ、同軸ケーブルの伝送損失による無線通信性能の劣化を防ぎ、高い無線通信性能を確保した無線固定端末装置を提供することを目的とする。また、高速データ伝送に対応するための同時に送受信可能な無線回路が簡単な構成で安価である無線固定端末装置を提供することを目的とする。

【０００９】

【課題を解決する手段】上記問題を解決するために、本発明においては、送信増幅器及び受信増幅器を備えた屋外固定端末装置と屋外アンテナを屋外にて接続し、屋外固定端末装置と屋内固定端末装置とをケーブルによって接続し、屋内固定端末装置と携帯端末装置の外部アンテナ端子とを屋内にて接続した構成とする。また、アンテナ共用器、送信増幅器及び受信増幅器を備えた屋外固定端末装置と屋外アンテナとを屋外にて接続し、屋外固定端末装置と屋内固定端末装置とをケーブルによって接続し、屋内固定端末装置と携帯端末装置の外部アンテナ端子とを屋内にて接続した構成とする。

【００１０】

【発明の実施の形態】本発明の請求項１に記載の発明は、屋外アンテナと屋外固定端末装置と屋内固定端末装置と携帯端末装置とを具備する無線固定端末装置であって、前記屋外固定端末装置は、送信増幅器と、受信増幅器と、外部端子と、前記屋外アンテナを前記送信増幅器の出力か前記受信増幅器の入力かのいずれかに選択して接続する第１高周波切替手段と、前記外部端子を前記送信増幅器の入力か前記受信増幅器の出力かのいずれかに選択して接続する第２高周波切替手段とを有し、前記屋内固定端末装置は、前記屋外固定端末装置の外部端子から屋内への引き込みケーブルに接続されており、前記携帯端末装置は、前記屋内固定端末装置を接続する外部アンテナ端子と内部アンテナとを切り替える切替手段を有する無線固定端末装置であり、携帯端末装置の無線回路を利用して通信を行なうとともに、同軸ケーブルの伝送損失を補償して高い無線通信性能を確保するという作用を有する。

【００１１】本発明の請求項２に記載の発明は、請求項１記載の無線固定端末装置において、前記屋外アンテナを複数設け、複数の前記屋外アンテナを選択する第３高周波切替手段を前記屋外固定端末装置に設け、前記携帯端末装置から出力される受信電界強度情報によって複数の前記屋外アンテナのうち最も受信電界強度が高いアンテナを選択する制御部を前記屋内固定端末装置に設けたものであり、時間分割複信方式（ＴＤＤ）において、送受信ダイバーシチ動作を行なうという作用を有する。

【００１２】本発明の請求項３に記載の発明は、屋外アンテナと屋外固定端末装置と屋内固定端末装置と携帯端末装置とを具備する周波数分割複信方式（ＦＤＤ）による無線固定端末装置であって、前記屋外固定端末装置は、前記屋外アンテナに接続されたアンテナ共用器と、前記アンテナ共用器に接続された送信増幅器と、前記アンテナ共用器に接続された受信増幅器と、前記送信増幅器に接続された送信入力端子と、前記受信増幅器に接続された受信出力端子とを有し、前記屋内固定端末装置は、前記屋外固定端末装置の送信入力端子及び受信出力端子から屋内への引き込みケーブルに接続され、前記携帯端末装置は、前記屋内固定端末装置に接続する外部送信出力端子と、前記屋内固定端末装置に接続する外部受信入力端子と、前記外部送信出力端子及び前記外部受信入力端子と内部アンテナとの切替手段とを有する無線固定端末装置であり、携帯端末装置の無線回路を利用して同時に送受信可能な無線回路を構成し、高速データ伝送を行なうという作用を有する。

【００１３】本発明の請求項４に記載の発明は、請求項３記載の無線固定端末装置において、前記屋外アンテナとしてアンテナ共用器に接続された第１屋外アンテナと第２屋外アンテナとを設け、前記受信増幅器として前記アンテナ共用器に接続された第１受信増幅器と前記第２屋外アンテナに接続された第２受信増幅器とを設け、前記第１受信増幅器及び第２受信増幅器の出力を選択する高周波切替手段を前記屋外固定端末装置に設け、前記携帯端末装置から出力される受信電界強度情報によって前記第１屋外アンテナ及び第２屋外アンテナのうち受信電界強度が高いアンテナを選択するよう前記高周波切替手段を制御する制御部を前記屋内固定端末装置に設けたものであり、周波数分割複信方式（ＦＤＤ）において、受信ダイバーシチ動作を行なうという作用を有する。

【００１４】本発明の請求項５に記載の発明は、屋内固定端末装置と携帯端末装置の外部アンテナ端子とを屋内にて随時接続し、送信時には、前記携帯端末装置の送信

部からの送信信号を前記屋内固定端末装置からケーブルを介して屋外固定端末装置に送って送信増幅器で増幅して屋外アンテナから送信し、受信時には、前記屋外アンテナからの受信信号を前記屋外固定端末装置の受信増幅器で増幅して、前記ケーブルと前記屋内固定端末装置を介して前記携帯端末装置の受信部に入力する無線固定端末装置の通信方法であり、携帯端末装置の無線回路を利用して通信を行なうとともに、同軸ケーブルの伝送損失を補償して高い無線通信性能を確保するという作用を有する。

【００１５】以下、本発明の実施の形態について、図１から図４を用いて説明する。

【００１６】（第１の実施の形態）本発明の第１の実施の形態は、屋内固定端末装置と携帯端末装置を接続し、送信時には携帯端末装置の送信部からの送信信号を屋外固定端末装置の送信増幅器で増幅して屋外アンテナから送信し、受信時には屋外アンテナからの受信信号を屋外固定端末装置の受信増幅器で増幅して携帯端末装置の受信部に入力する無線固定端末装置である。

【００１７】図１は、本発明の第１の実施の形態における無線固定端末装置の基本的構成を示すものである。図１において、100は屋内の携帯端末装置、200は屋内固定端末装置、300は屋外固定端末装置、400は無線基地局、500は屋外の携帯端末装置を示す。無線基地局400は屋外に設置され、屋内に設置された無線固定端末装置（100、200、300）や屋外の携帯端末装置500と、一般には２ＧＨｚ帯のディジタル無線通信により接続されており、時間分割複信方式（ＴＤＤ）として動作し、一般には、約数ミリ秒毎に送信受信を繰り返して（同時に送受信はしない）通信を行なうものである。

【００１８】携帯端末装置100は、通常は屋外で使用する携帯端末として使用されるが、本実施の形態では、屋内において、固定端末の無線部及び通話機能を担うものである。携帯端末装置100は、内蔵アンテナ101、受信回路102、送信回路103、制御部104、送受切替部105、内部外部アンテナ切替部106、送受切替信号107、外部アンテナ端子108から構成されている。携帯端末装置100では、制御部104によって送受切替部105、受信回路102及び送信回路103を時間分割で制御し、送信受信を繰り返すように動作する。内部外部アンテナ切替部106は、外部アンテナ端子108の検出機能により切り替えられ、外部アンテナ端子108が接続されると、内部アンテナ側をＯＦＦし、外部アンテナ側に接続するように動作する。外部アンテナ端子108及び送受信切替信号107は、屋内ケーブル600（一般には数ｍの柔軟で簡単に脱着可能なケーブル）によって、屋内端末装置200に接続される。

【００１９】屋内固定端末装置200は、電源部201、制御部202より構成される。屋内固定端末装置200において、携帯端末装置100の外部アンテナ端子108からの信号はそのまま屋外ケーブル700へ伝送し、送受切替信号107は制御部202により緩衝増幅した後、送受切替信号204として屋外ケーブル700へ伝送し、電源部201から屋外固定端末装置300用の電源203を屋外ケーブル700へ出力する。

【００２０】屋外固定端末装置300は、家屋の壁などの屋外に設置され、送受切替回路（１）301、送信増幅器302、受信低雑音増幅器303、送受切替信号304、送受切替回路（２）305、バンドパスフィルタ306、屋外アンテナ307により構成される。高周波信号（同軸ケーブルを通る）、送受切替信号304及び電源308は、屋外ケーブル700（一般には５ないし10ｍ程度）によって屋内に引き込まれ、屋内固定端末装置200に接続される。

【００２１】以上の構成による動作を以下に説明する。屋外固定端末装置300の送信増幅器302は、ケーブル600及び700での送信信号の損失分（５ないし10ｄＢ程度）を補うための電力増幅を行ない、受信低雑音増幅器303は、屋外アンテナ307からの受信信号を最小（最短距離）の損失にて入力され、上記ケーブル損失分だけ低雑音増幅するように動作する。屋外固定端末装置300における送受信切替動作は、携帯端末装置100からの送受切替信号107を基準として、送受切替回路（１）301及び（２）305が切り替えられる。したがって、送信回路103からの送信信号は、ケーブル600、屋内固定端末装置200、ケーブル700及び送信増幅器302を介して、屋外アンテナ307から無線基地局400への上り無線信号として送出される。また、無線基地局400からの下り無線信号は、屋外アンテナ307、受信低雑音増幅器303、ケーブル700、屋内固定端末装置200及びケーブル600を介して受信回路102に入力される。

【００２２】以上のような構成により、携帯端末装置100に簡単に着脱可能なケーブル600を接続するだけで、屋内にて固定端末装置として利用することができ、かつ、屋外及び屋内ケーブルの損失を補償して、高い無線性能を実現することができる。また、携帯端末装置100において、本実施の形態を実現するために追加される要素としては、送受切替信号107及び外部アンテナ端子108のみであるが、これらの要素は、一般の携帯端末装置においては無線性能測定用端子として既に用意されている場合が多い。また、固定端末装置として必要な要素としては、電源部201、制御部202、送受切替回路（１）301、送信増幅器302、受信低雑音増幅器303、送受切替信号304、送受切替回路（２）305、バンドパスフィルタ306、屋外アンテナ307であり、必要最小限の無線回路のみによって、本実施の形態の機能を実現することができる。

【００２３】以上のように本発明の第１の実施の形態によれば、無線固定端末装置に携帯端末装置との接続回路を設けたので、携帯端末装置を屋内にて固定端末装置として利用することができ、かつ、ケーブルの損失を補償して高い無線性能を実現できる。また、必要最小限の無線回路によって無線固定端末装置を実現できる。

【００２４】（第２の実施の形態）本発明の第２の実施

の形態は、屋内固定端末装置に接続された携帯端末装置から出力される受信電界強度情報によって、複数の屋外アンテナのうち最も受信電界強度が高いアンテナを選択することにより、時間分割複信方式（ＴＤＤ）において送受信ダイバーシチ動作を行なう無線固定端末装置である。

【００２５】本発明の第２の実施の形態の無線固定端末装置が、第１の実施の形態と異なる点は、送受信ダイバーシチ機能を追加したことである。

【００２６】図２は、本発明の第２の実施の形態における無線固定端末装置の基本的構成を示すものであり、図１における無線固定端末装置に送受信ダイバーシチ機能を追加するように構成したものである。図２において、図１と同一の符号のものは同一の機能を有し、109及び206は受信電界強度信号（ＲＳＳＩ）、110及び207はバーストタイミング信号、205は制御部、208及び311はダイバーシチ切替信号、310はアンテナ切替回路、314及び315はそれぞれ第１及び第２屋外アンテナを示す。図２において、送受信ダイバーシチ以外の動作としては、図１の動作と同様な動作を行なう。

【００２７】以下、送受信ダイバーシチの動作を説明する。図２において、制御部205は、バーストタイミング信号110（基地局に同期した送受信タイミングの信号）を時間基準として、受信電界強度信号（ＲＳＳＩ）109を検出する。制御部205はまた、アンテナ切替回路310を制御し、第１及び第２屋外アンテナ314及び315を切り替える。ここで、制御部205は、固定端末装置が割り当てられている受信時間単位（自受信スロット）直前に、第１及び第２屋外アンテナ314及び315のそれぞれによる受信電界強度信号（ＲＳＳＩ）109を検出し、受信時間単位（自受信スロット）では、受信電界強度信号（ＲＳＳＩ）109が大きい方の屋外アンテナ314又は315で受信するように制御する。また、本実施の形態におけるシステムは時間分割複信方式（ＴＤＤ）であり、上り下り（送受信）の周波数が同一であることから、受信時間単位（自受信スロット）直後の送信時間単位（自送信スロット）では、直前に受信時間単位（自受信スロット）と同一の屋外アンテナ314又は315で送信することで、送受信ダイバーシチを実現することができる。

【００２８】以上のように、本発明の第２の実施の形態によれば、携帯端末装置から出力される受信電界強度情報によって屋外アンテナを選択するので、携帯端末装置に送受信ダイバーシチ機能を持つことなく、必要最小限の無線回路で無線固定端末装置の送受信ダイバーシチ機能を実現できる。

【００２９】（第３の実施の形態）本発明の第３の実施の形態は、屋内固定端末装置と携帯端末装置を随時接続し、携帯端末装置の送信部からの送信信号を屋外固定端末装置の送信増幅器で増幅して屋外アンテナから送信し、屋外アンテナからの受信信号を屋外固定端末装置の受信増幅器で増幅して携帯端末装置の受信部に入力するように構成された周波数分割複信方式（ＦＤＤ）による無線固定端末装置である。

【００３０】本発明の第３の実施の形態の無線固定端末装置が、第１の実施の形態と異なる点は、周波数分割複信方式（ＦＤＤ）による高速データ伝送に対応するように構成したことである。

【００３１】図３は、本発明の第３の実施の形態における無線固定端末装置の基本的構成を示すものであり、図１における無線固定端末装置を周波数分割複信方式（ＦＤＤ）による高速データ伝送に対応するように構成したものである。図３において、図１と同一の符号のものは同一の機能を有し、111は内部アンテナ外部端子切替部、112は外部受信端子、113は外部送信端子、114は内部外部切替制御信号、312は屋外アンテナ、313はアンテナ共用器を示す。携帯端末装置100が屋内固定端末装置200に接続されると、内部アンテナ外部端子切替部111は、屋内固定端末装置200から出力されている内部アンテナ外部端子切替部111は、屋内固定端末装置200から出力されている内部外部切替制御信号114により、外部受信端子112及び外部送信端子113側に切り替えられる。また、アンテナ共用器313は、一般には誘電体フィルタで構成され、送信増幅器302と受信低雑音増幅器303の両方で同時に屋外アンテナ312を共用する機能を有する。

【００３２】一般に周波数分割複信方式（ＦＤＤ）では、上り（送信）及び下り（受信）周波数が近接しており、アンテナ共用器313は近接した周波数におけるアイソレーションを確保するために大型で高価な誘電体フィルタが使用される。したがって、携帯端末装置100においては、上記アンテナ共用器を内蔵することが難しいために、周波数分割複信方式（ＦＤＤ）であっても、受信時間単位（自受信スロット）と送信時間単位（自受信スロット）を時間的の重ならないようにして、同時に送受信を行なわないようにしている。携帯端末装置においては音声通話が主目的であるため、その伝送速度は一般のは32ｋｂｐｓ程度であり、上記の構成で必要十分であった。

【００３３】しかしながら、固定端末装置においては、高速データ伝送（一般には64ｋｂｐｓ以上）が要求される場合が多く、この場合には、複数の受信時間単位（自受信スロット）と送信時間単位（自送信スロット）を利用する必要があるために、同時に送受信可能な構成が要求される。

【００３４】携帯端末装置100の送信回路103からの送信信号は、屋内ケーブル600、屋内固定端末装置200及び屋外ケーブル700を介して送信増幅部302に入力され増幅された後、アンテナ共用器313を介して屋外アンテナ312から送信される。このとき、アンテナ共用器313では送信信号は受信低雑音増幅器303側には漏れ込まない。また、屋外アンテナ312で受信した受信信号はアンテナ共

用器313、受信低雑音増幅器303、屋内ケーブル700、屋内固定端末装置200及び屋外ケーブル600を介して携帯端末装置100の受信回路102に入力される。

【００３５】以上のように、本発明の第３の実施の形態によれば、同時に送受信する機能を固定端末側に保有することで、アンテナ共用器を持たない小型低価格の携帯端末装置を利用して高速データ伝送ができる。

【００３６】（第４の実施の形態）本発明の第４の実施の形態は、携帯端末装置から出力される受信電界強度情報によって第１及び第２屋外アンテナのうち受信電界強度が高いアンテナを選択して、周波数分割複信方式（ＦＤＤ）において受信ダイバーシチ動作を行なう無線固定端末装置である。

【００３７】本発明の第４の実施の形態の無線固定端末装置が、第３の実施の形態と異なる点は、受信ダイバーシチ機能を追加したことである。

【００３８】図４は、本発明の第４の実施の形態における無線固定端末装置の基本的構成を示すものであり、図３における無線固定端末装置に受信ダイバーシチ機能を追加するように構成したものである。図４において、図２及び図３と同一の符号のものは同一の機能を有し、314及び315はそれぞれ第１及び第２屋外アンテナ、316はバンドパスフィルタ、317は第２受信低雑音増幅器、318は受信アンテナ切替回路を示す。第２屋外アンテナ315で受信された信号は、上り（送信）帯域の周波数成分を除去するバンドパスフィルタ316を介して第２受信低雑音増幅器317入力され低雑音増幅される。その出力は受信アンテナ切替回路318によって、第１受信低雑音増幅器303の出力とのいずれかを選択され、屋内ケーブル700、屋内固定端末装置200及び屋外ケーブル600を介して、携帯端末装置100の受信回路102に入力される。ここで、図２と同様に、制御部205は、受信電界強度信号（ＲＳＳＩ）109が大きい方の屋外アンテナ314又は315で受信するように制御する。

【００３９】以上のように、本発明の第４の実施の形態によれば、受信ダイバーシチ機能を持たない携帯端末装置から出力される受信電界強度情報によって、受信電界強度が高いアンテナを選択するので、必要最小限の無線回路で無線固定端末装置の受信ダイバーシチ機能を実現できる。

【００４０】

【発明の効果】以上のように本発明は、携帯端末装置を屋内にて固定端末装置として利用するので、無線固定端末装置の無線回路の一部を省いてコストを削減できるという効果を有する。

【００４１】また、屋外固定端末装置の増幅器でケーブル損失を補償するので、高い無線性能を必要最小限の無線回路によって実現できるという効果を有する。

【００４２】また、携帯端末装置から出力される受信電界強度情報によって屋外アンテナを選択するので、送受信ダイバーシチ機能を持たない携帯端末装置を利用して必要最小限の無線回路で、時間分割複信方式（ＴＤＤ）で送受信ダイバーシチ動作を行なう無線固定端末装置が実現できるという効果を有する。

【００４３】また、同時に送受信する機能を固定端末側に設けたので、アンテナ共用器を持たない携帯端末装置でも高速データ伝送ができるという効果を有する。

【００４４】また、携帯端末装置から出力される受信電界強度情報によって屋外アンテナを選択するので、周波数分割複信方式（ＦＤＤ）で受信ダイバーシチ動作を行なう無線固定端末装置が実現できるという効果を有する。

【図面の簡単な説明】

【図１】第１の実施の形態における無線固定端末装置の基本的構成図、

【図２】第２の実施の形態における無線固定端末装置の基本的構成図、

【図３】第３の実施の形態における無線固定端末装置の基本的構成図、

【図４】第４の実施の形態における無線固定端末装置の基本的構成図、

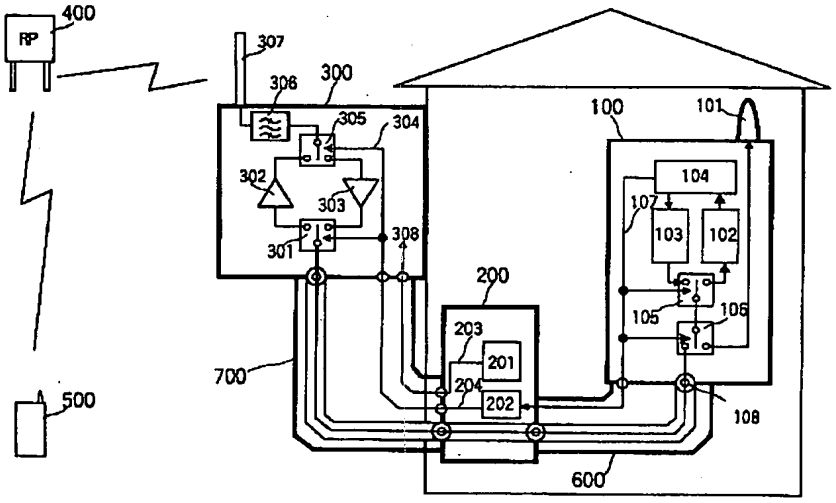
【図５】従来例における無線固定端末装置の基本的構成図である。

【符号の説明】

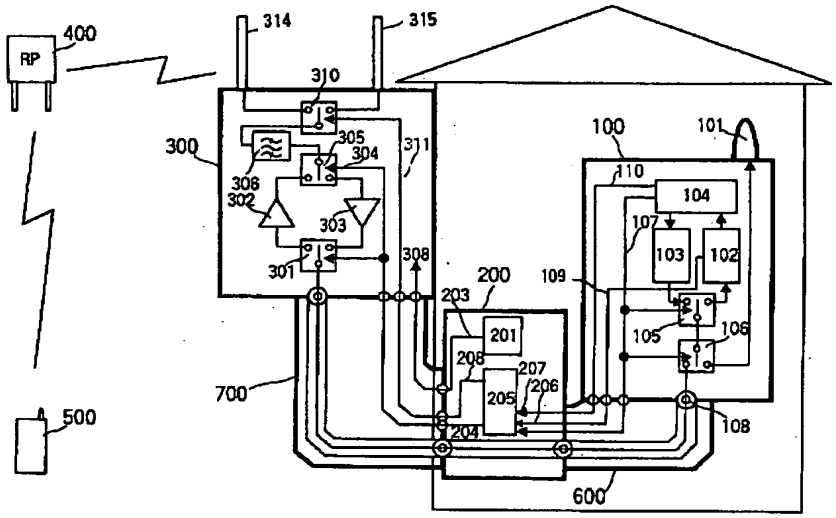
100　屋内の携帯端末装置
101　内蔵アンテナ
102、802　受信回路
103、803　送信回路
104、202、205、804　制御部
105　送受切替部
106　内部外部アンテナ切替部
107、204、304　送受切替信号
108　外部アンテナ端子
109、206　受信電界強度信号（ＲＳＳＩ）
110、207　バーストタイミング信号
111　内部アンテナ外部端子切替部
112　外部受信端子
113　外部送信端子
114　内部外部切替制御信号
200　屋内固定端末装置
201　電源部
203、308　電源
208、311　ダイバーシチ切替信号
300　屋外固定端末装置
301　送受切替回路（１）
302　送信増幅器
303　受信低雑音増幅器
305　送受切替回路（２）
306、316　バンドパスフィルタ
307、312、806　屋外アンテナ

310　アンテナ切替回路
313　アンテナ共用器
314　第１屋外アンテナ
315　際２屋外アンテナ
317　第２受信低雑音増幅器
318　受信アンテナ切替回路
400　無線基地局
500　屋外の携帯端末装置
600　屋内ケーブル
700　屋外ケーブル
800　固定端末装置
801　送受切替回路
805　同軸ケーブル
807　モジュラーケーブル
900　家庭用電話機

【図１】



【図２】



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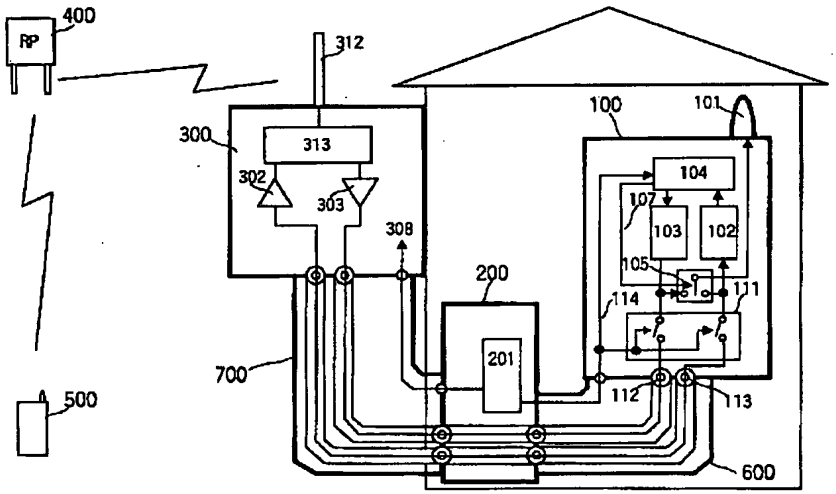
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313
302
303
308
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101
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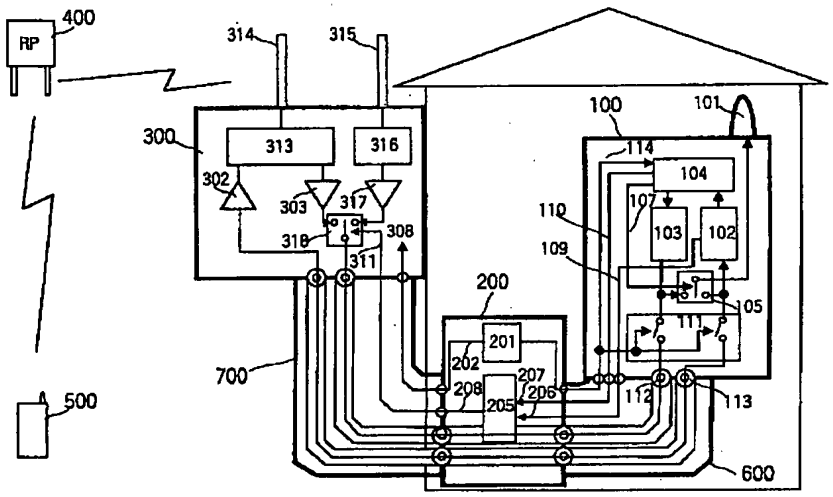
103
102
105
111
114
200
201
700
500
112
113
600

【図４】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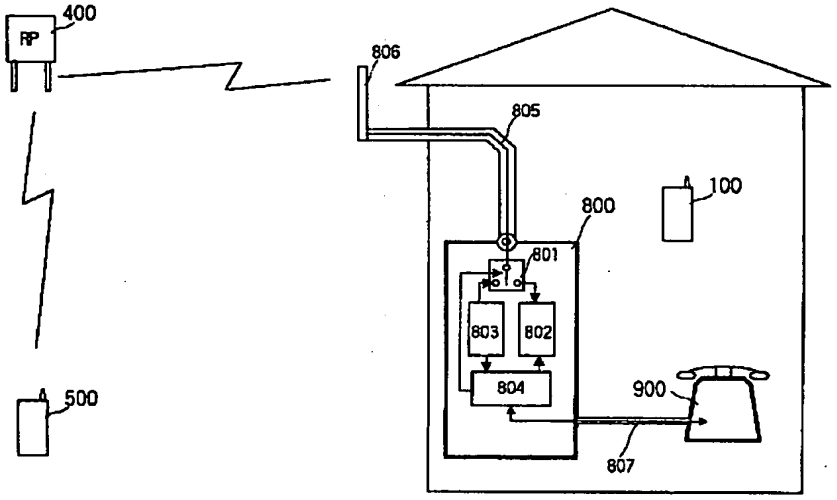
【図５】



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